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MEMORANDUM

**TO:** Department Chairpersons and Division Chiefs

**FROM:** Stephen J. Weiss, M.D.  
Chief, Molecular Medicine & Genetics

**SUBJECT:** **POSTDOCTORAL RESEARCH TRAINING PROGRAM, 2007**

**DATE:** April 13, 2007

In collaboration with the Medical School, I am pleased to announce that the Postdoctoral Research Training Program will be held again this year with a start date of July 2, 2007. As in the past, the program is designed to introduce those individuals with a strong interest in pursuing a career in academic medicine to new and emerging concepts in cell and molecular biology. The entire course will encompass a 9 week period (July-August) which is divided into two basic categories: 1) cell biology and biochemistry and 2) molecular biology and genetics. These two sections will be introduced by a core of 8 faculty members who have been chosen from the Departments of Biochemistry, Human Genetics, Physiology, Pathology, Pharmacology, Biology, Internal Medicine, as well as the HHMI. The program is designed to allow each of the core faculty members to spend one uninterrupted week with the participants, during which time they are immersed in a combination of didactic and laboratory exercises. In part, the program is constructed to provide a basic framework of knowledge in a variety of disciplines. However, more importantly, the Course is designed to introduce the students to the methods of scientific thought, inquiry and analysis via the presentation of specific research topics. In order to accomplish this goal, each of the faculty will analyze, in depth, a key question within their field of expertise. Each week is introduced with a review of basic concepts relevant to each of the specific topics, an outline of the areas of controversy and finally, the analysis of the relevant scientific literature that has either attempted to or succeeded in addressing these issues. In conjunction with this approach, a series of laboratory exercises have been designed to not only familiarize the participants with a variety of techniques used in cell and molecular biology, but to reinforce basic principles and to demystify techniques that intimidate the uninitiated. Taken together, all sessions are designed to use emerging concepts in cell and molecular biology as a means of introducing the participants to the critical importance of identifying the "right"

question, selecting the "best" tools to answer the question, using the appropriate logic to interpret experimental results and finally, constructing appropriate conclusions.

To apply, Program applicants should be identified by the appropriate Division Chief or Chairperson and their C.V. sent to me along with a letter of support. *In the past, there has been some confusion with regard to this requirement and individual faculty have nominated students without the knowledge of their Chief or Chairperson.* Because the Medical School charges tuition for the Course and the issue of clinical responsibilities must be cleared by Division or Department heads, all nominations should come directly from your office. Please include a description of the applicant's career goals. The cost is \$6500 and paid by the participant's Department/Division. In order to allow us to interview and select the participants in a timely manner, all applications should be submitted no later than June 22, 2007. I would also like to remind everyone that *participants should be freed of all clinical responsibilities from July through September - night call cannot be assigned. However, each week will end by Friday noon so that clinical responsibilities can be assigned for Friday afternoon. In addition, weekends will be kept free from course-related responsibilities.*

Finally, I have found that interested Fellows are sometimes dissuaded by their mentors from applying to the Program under a mistaken impression that we are providing a simple "techniques" course. I would like to emphasize the fact that the Program does not emphasize techniques, but rather problem solving exercises. In the 18 years that I have directed the course - with a student population ranging from the most naive to the most seasoned M.D.- Ph.D.s - none of the Faculty have ever identified a student who was not challenged - more than they liked or anticipated - by the Program. Students rarely, if ever, have the opportunity to interact closely with 8 different leaders in the field - a week at a time - in subjects ranging from chicken embryology to molecular genetics. Many of our students are now tenure-track or tenured faculty and all have agreed that the experience was not only memorable, but highly useful in terms of introducing them in a "jump-start" fashion to the rigors of scientific analysis. Because of its success, the Program has attracted queries from across the country (Harvard, UCSF, Penn, etc.) and it is not because we teach techniques, but rather because we emphasize the development of the key problem solving skills that are critical to success in the laboratory. Despite my responsibilities as the Chief of the Division of Molecular Medicine & Genetics, I have elected to continue acting as the Director of the Program as well as serving as one of the instructors. I have done this only because I believe that the Program provides students with a unique introduction to the rigors of scientific thought and analysis.

If you have any thoughts or questions regarding the appropriateness of this exercise for one of your Fellows, please contact me directly at 4-0030.

## **Description of Postdoctoral Research Training Program**

- I. Program design and philosophy: Since 1986, the University of Michigan Medical School has offered the Postdoctoral Research Training Program that has to date been completed by more than 200 trainees. The Program is designed to provide those individuals who have i) received their M.D. or M.D./Ph.D. degrees, ii) completed their clinical training and iii) expressed a strong interest in pursuing a career in academic medicine with a rigorous introduction to new and emerging concepts in cell and molecular biology. The course of study encompasses a 10 week, full-time commitment (July-September, Monday-Friday, 9:00 a.m. - 6:00 p.m.) that is divided into 10 one-week sections. Five of the weeks are devoted to topics in cell biology or biochemistry followed by a one week introduction to basic concepts in molecular biology. After this review is completed, the second 5 week block returns to the basic format and focuses on five problems in molecular biology. In part, each week is designed to provide the students with a basic framework of knowledge in a number of new disciplines. However, more importantly, we seek to introduce the students to the methods of scientific thought and analysis in a rigorous and organized manner. Thus, in lieu of 3 months of standard lectures (whose content will be inevitably forgotten), the Program's format is structured as a series of distinct exercises in problem solving. At the beginning of each week, one of the nine faculty selected to participate in the Program introduces the students to a single, key problem within their field of expertise. The instructor's goal is to lead the students to the problem's solution via a series of carefully planned classroom discussions and laboratory-based experiments. In the classroom setting, the instructor introduces the students to the week's problem on Monday and provides a standard lecture-type background (usually 2-3 hours). Throughout the remainder of the week, a Socratic approach is adopted wherein the students play an active role in analyzing a series of four research articles that are assigned for reading at a rate of one paper per evening. These articles (reviews are not used) are specifically chosen such that their correct interpretation will allow the students to directly participate in the resolution of the week's problem. This format is in some ways similar to a journal club save for the fact that the faculty directs the course of the discussions by both questioning the students and soliciting their answers. In this manner, the students are "forced" to critically analyze the methods, results, and conclusions of a focused series of papers under the guidance of a recognized expert in that field. Typically, the review/discussion of a single article with the class requires ~ 3-4 hours. Following this analysis, a one hour introduction to the next article is given in order to "arm" the students with enough information to allow them to review and critique the article assigned for the following day. This cycle is repeated until the final paper is analyzed on Friday at which time the accumulated information is reviewed and a conclusion constructed.

Because we feel that an analytical and logical approach to problem solving requires an opportunity to also generate and assimilate data acquired in a laboratory setting, a series of benchside experiments have been designed to reinforce those concepts introduced in the classroom. As in the didactic sessions, the focus in the laboratory is to "think and solve" rather than to reduce problems to "cookbook" exercises. Taken together, the

classroom and laboratory sessions are all designed to use emerging concepts in the biological sciences as a means of introducing the participants to the critical importance of identifying the "right" question, selecting the "best" tools to answer that question, using sound logic to interpret experimental results and correctly synthesizing the information to construct appropriate conclusions. In many respects, this approach is similar to that used to teach a novice the basics of chess. Each week the students are given a small number of new pieces of information to review and they are then given the opportunity to use this information to "play", i.e., to seek solutions to a given problem with a limited, but sufficient, pool of data. Thus, rather than merely challenging the students to memorize a large number of facts, we give them the opportunity to solve difficult problems in cell and molecular biology through critical analysis.

- II. Faculty: The Program is led by a group of 9 instructors who are selected by the Program Director from a list of "star quality" faculty identified by Department Chairs in the Medical School. However, just as importantly, all of the instructors are deeply committed to the training of young investigators and serve as enthusiastic role models for the students. Indeed, rather than construct a course of study with specific subject materials in mind, efforts focus on identifying premier instructors who are given free reign in selecting the topics for discussion and analysis.
- III. Students: The Program is open to those postdoctoral fellows (M.D., M.D./Ph.D. or Ph.D.) who have elected to spend a minimum of 2 years in a research laboratory. Because of the nature of the Program's design (i.e., active student participation in both the classroom and laboratory), no more than 15 fellows can be accommodated per session. Thus, individuals are selected on the basis of letters of recommendation from a nominating Department Chair or Division Head.

In summary, a course of study has been designed whose specific goal is to introduce students to a series of rigorous exercises in problem solving from the perspective of cell and molecular biology. Minimally, the students are exposed to important new areas of investigation and are given the opportunity to see complex techniques "demystified". In addition, at a time when young investigators are increasingly enchanted with technology-oriented approaches, the Program plays an important role by demonstrating that methodology is simply a set of tools. Rather, efforts focus on helping students realize that clarity of thought and creativity remain the most difficult and important skills to acquire. Of course, no program can transform an individual into a successful scientist. However, for the properly motivated, the Program offers students an opportunity to be taken under the collected wing of a group of dedicated scientists who both educate and spark desire.

# POSTDOCTORAL RESEARCH TRAINING PROGRAM

2007

DATE	COURSE FACULTY	TOPIC
July 9-13	Thomas E. Wilson, M.D., Ph.D. Associate Professor of Pathology	Molecular Biology Reading and Didactics
July 16-20	Thomas E. Wilson, M.D., Ph.D. Associate Professor of Pathology	Genome Maintenance and Expression
July 23-27	Kenneth M. Cadigan, Ph.D. Associate Professor of Molecular, Cellular & Developmental Biology	Wnt Signal Transduction
July 30-August 3	John Y. Kuwada, Ph.D. Professor and Associate Chair for Research and Facilities, Department of Molecular, Cellular and Developmental Biology	Analysis of Gene Function in Zebra Fish
August 6-10	Gregory R. Dressler, Ph.D. Associate Professor of Pathology	Epigenetics, Chromatin, and Development
August 13-17	Richard R. Neubig, M.D., Ph.D. Professor of Pharmacology	Signaling by G Proteins and Its Regulation
August 20-24	Colin S. Duckett, Ph.D. Associate Professor of Internal Medicine and Pathology Associate Director, Molecular Mechanisms of Disease	Control of Cellularity by Apoptosis (programmed cell death)
August 27-31	Martin G. Myers, M.D., Ph.D. Assistant Professor of Molecular & Integrative Physiology	Hypothalamic Signal Transduction
September 3-7	Stephen J. Weiss, M.D. Upjohn Professor of Medicine Chief, Molecular Medicine & Genetics Research Professor, Life Sciences Institute	Membrane-type Matrix Metalloproteinases